

**DRINKING WATER
QUALITY ISSUES FOR
DELTA SOURCE WATERS**

ISSUE PAPER

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Santa Clara Valley Water District

Briefing Paper

Prepared for the Bay Delta Oversight Council

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Introduction

This paper was prepared in response to an invitation from the Bay Delta Oversight Council to present the Santa Clara Valley Water District's (SCVWD) perspective on the following two issues:

1. Special processes and treatment methods required in the SCVWD's treatment system as a direct result of Delta water constituents.
2. Projected impacts on SCVWD's system from pending EPA standards and from future phases of EPA standard setting procedures.

Background

The Santa Clara Valley Water District is a public agency established by special act of the State of California Legislature to provide water supply and flood protection to Santa Clara County's 1.5 million residents. Santa Clara County has four sources of water supply: 1) local groundwater and surface water, 2) imported Delta water from the South Bay Aqueduct (SBA) of the State Water Project, 3) imported Delta water from the San Felipe Division of the federal Central Valley Project (CVP), and 4) water imported through the Hetch Hetchy Aqueduct of the City and County of San Francisco.

The District is one of three agencies along with Alameda County Water District and Zone 7 of Alameda County Flood Control and Water Conservation District, which imports Delta water through the South Bay Aqueduct. The District uses imported Delta water primarily to supply drinking water treatment plants and secondarily to recharge underground aquifers. The District began receiving Delta water through the SBA in 1965. The District's maximum entitlement from the SBA is 100,000 acre feet per year.

The District began receiving Delta water from the San Felipe Division of the Central Valley Project via San Luis Reservoir in 1987 and has contracted for a maximum delivery of 152,500 acre feet per year.

Based on current entitlements, Delta water is projected to supply about half of the projected 2020 water needs in the county. In recent drought years when local reservoirs were empty and the groundwater basin was drawn down, Delta water accounted for as much as 90% of the County's water supply. For these reasons, the quality of the Delta water supply is extremely important to the residents of Santa Clara County.

Delta Water Quality Issues of Concern

The District operates three drinking water treatment plants with a combined capacity of 220 million gallons per day. Each plant utilizes conventional treatment with flocculation, coagulation, sedimentation, and filtration. Chlorine is used as the primary disinfectant, and chloramines (chlorine and ammonia) is used to maintain a residual disinfectant in the distribution system. These facilities treat Delta water and, in wet years, local surface water. The District distributes this water to private and municipal water agencies throughout the county, who deliver it to homes and businesses.

Delta water delivered to the District treatment facilities through the South Bay Aqueduct is received within 24 hours after it leaves the Delta. This makes the District, along with the other two SBA contractors, unique in that we must deal immediately with changing conditions in the Delta and the variability of Delta water quality and have no storage to buffer rapid quality changes. Del Valle Reservoir in Alameda County has been used to blend up to 2,000 acre feet of water into the SBA during late summer months to help combat taste and odor problems from algae, but this small quantity of water has a minor impact on water quality given the total deliveries from the Delta.

The District also contracts with the Central Valley Project to receive a significant portion of its imported Delta water supply through San Luis Reservoir. Although San Luis water is pumped from the Delta, the water quality issues are different for this source in comparison to the South Bay Aqueduct. San Luis Reservoir is typically filled in the fall and winter which stabilizes TOC and bromide concentrations. San Luis water can be problematic to treat for the remainder of the year if the concentrations of these constituents are relatively high during pumping. The opposite is also true if low concentrations are encountered during pumping. This situation becomes more acute if additional restrictions are placed on allowable time periods for Delta pumping.

Turbidity

One significant aspect of the District's Delta water supply is the high variability of its quality. The SBA experiences wide variations daily and seasonally for water quality parameters such as turbidity, pH, temperature, and total organic carbon. These wide variations make treatment of Delta water particularly problematic, requiring constant process changes to try and accommodate changing influent quality. Figure 1 shows a sample plot of daily water turbidities leaving the Delta at Banks Pumping Plant and arriving at the District's Rinconada Treatment Plant. Turbidity spikes of 80 to 90 NTU's force constant changes in and evaluations of treatment strategies at the District water treatment plants. The particles which create turbidity act as refuges for bacteria and viruses so when turbidity increases, so must the amount of chlorine used for disinfection. This leads to increased production of disinfection byproducts. Removing this turbidity also requires the addition of large amounts of chemicals such as alum and polymers which creates large quantities of metal containing sludge dewatering and disposing.

Total Organic Carbon

Another Delta water quality constituent of concern to the District are the relatively high levels of total organic carbon. This total organic carbon contains precursor material which combine with chlorides and bromides to form trihalomethanes and other disinfection byproducts when the District adds chlorine to disinfect the water at its treatment plants. Trihalomethanes

(THMs) are currently regulated and the EPA Regulatory Negotiations (REG-NEG) currently underway in Washington D.C. will likely regulate additional disinfection byproducts and set action levels for TOC. In the fall of 1992, the City of Cupertino, which receives their treated water from the District, violated the current federal standards for trihalomethanes and had to issue public notification to all customers under order of the California Department of Health Services. The District's running annual average (the measure of compliance for THMs) was at or just below the current standard of 0.10 milligrams (100 micrograms) per liter several times in the last few years. The District is in the process of moving chlorine addition to a later point in the treatment process to try and reduce THM formation. The District is also currently spending \$2 million piloting new treatment processes to try to prevent future violations of the current standards and to address the standards that will evolve from the REG-NEG process.

Chlorides and Bromides

Chlorides and especially bromides present in Delta water also contribute to the formation of disinfection byproducts. The THM standard is weight based, so bromides, which are heavier than chlorides, make a more significant contribution to THM levels. The District's current treatment facilities do not remove these constituents. Lowering the amount of chlorine used reduces the byproducts, but has encouraged the growth of biofilms in the District's distribution system which resulted in compliance difficulties with the new Total Coliform Rule in 1992. Sodium, also associated with the elevated levels of chlorides and bromides from seawater intrusion, is not removed in the treatment process and the District has had to notify our retail agencies on several occasions that levels were of concern to individuals with sodium restricted diets.

Tastes and Odors

On a seasonal basis, the District experiences taste and odor problems associated with algae in the Delta water delivered to the District through the SBA and CVP. Wide fluctuations in levels and algae growths in San Luis Reservoir have required the use of alternative sources of water and the installation of covers over reservoir intake structures to prevent the entry of taste and odor causing algae into the water treatment plants. The District utilizes a flavor profile panel of water tasters to try and detect taste and odor problems early on before customer complaints start. In order to respond to these taste and odor problems, the District is forced to feed powdered activated carbon to try and adsorb the taste and odor causing chemicals. This also increases the amount of chlorine which must be used. The District is in the process of installing potassium permanganate feed systems on the pipelines which serve Delta water to the treatment plants to try to prevent or reduce taste and odor complaints.

Copper Loading to San Francisco Bay

In order to try and eliminate the taste and odor causing algae in Delta water delivered through the SBA, DWR treats the SBA with copper sulfate periodically during summer months. This addition of copper to the Delta water supply coming into Santa Clara County contributes to the copper loading to San Francisco Bay through wastewater treatment plant discharge. The San Francisco Bay Regional Water Quality Control Board has directed the District, DWR and other agencies to propose ways to mitigate this loading. At Regional Board direction, the District has initiated a low level metals survey of Delta water delivered to the District to determine whether any other metals are present in Delta water deliveries which impact San Francisco Bay water quality.

Projected Impacts from Pending EPA Regulations

The pending EPA regulation which will have the most significant impact on the District is the Disinfectant/Disinfection Byproducts Rule currently under development. The projected impacts of this regulation are directly attributable to the quality problems identified above for Delta water. The quality problems associated with Delta water are recognized in a 1991 report to the legislature prepared by the State Water Resources Control Board which states "... It is clear that water utilities charged with protecting public health through treating drinking water from the Delta will face serious problems in meeting anticipated state and federal standards."

Figure 2 is a plot of historical Total Trihalomethane (TTHM) concentrations in the effluent from the District's Rinconada Water Treatment Plant. Also shown are the concentrations of 80 and 40 micrograms per liter, the levels of TTHM currently under discussion for regulation in the first and second phases respectively of a new D/DBP Rule. As the plot shows, the treatment plant effluent concentrations would have been out of compliance with a standard of 80 micrograms per liter for most of 1988 through 1990. Rinconada Treatment Plant could not have met a standard of 40 micrograms per liter. These represent treatment plant effluent levels. Distribution system levels, the basis for compliance, were at or even higher levels than the effluent concentrations shown. Additionally, regulation of another type of byproduct, haloacetic acids, is also under discussion as part of the REG-NEG process. These have not been previously regulated and data is not available for the District to assess historical performance with respect to the regulatory levels under discussion.

The wide fluctuations in quality, the elevated levels of TOC, chlorides, and bromides will make compliance with more stringent disinfection byproduct regulations very difficult. The District estimates that compliance with the rule will likely require extensive capital improvements at all three of our treatment plants.

The projected capital improvements are estimated to have a total cost ranging from \$94 million to \$163 million depending on the specific standards set in the final rule. This cost estimate is based on converting from chlorine disinfection to ozone disinfection to reduce THM levels. Ongoing, additional operating costs are estimated at \$3 million to \$5 million per year. If regulatory levels for byproducts of ozone disinfection, such as bromate, are set at very low levels, ozone may not be a feasible technology for treating Delta water. One of the difficult issues facing the participants in the REG-NEG effort is the fear of setting standards that force utilities to change to new disinfection processes whose downside risk is less well identified than current chlorine technology. The presence of high levels of unidentified TOC and of bromides and chlorides in Delta water means that extensive pilot work is needed to determine what new risks might be associated with a change in disinfection technology. If the District were required to use a membrane filtration process, the initial capital costs and annual operating costs would likely be substantially higher than current estimates.

The D/DBP Rule currently under discussion in the REG-NEG process will likely require utilities to implement new and expensive monitoring for viruses and the protozoans *Giardia* and *Cryptosporidium* in their source waters. This data will be used to develop an enhanced surface water treatment rule which will require even more stringent treatment to remove or inactivate pathogenic organisms. Delta water is subject to contamination with these organisms from upstream inputs of wastewater and urban runoff, although the levels of contamination have not been well defined, because comprehensive monitoring has not yet taken place. The presence of these organisms in Delta water will likely trigger the need for

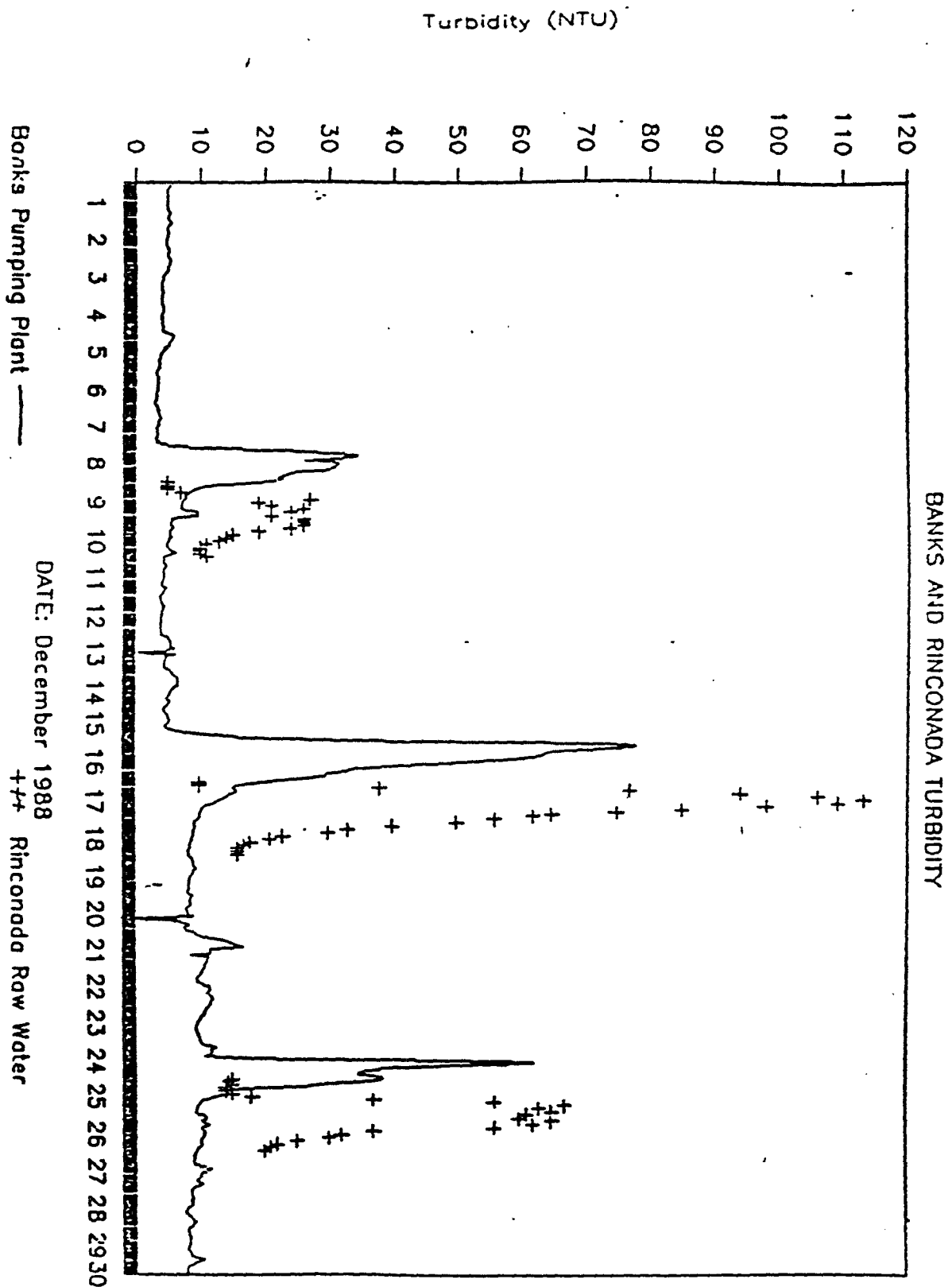
additional process modifications and associated expenditures in order to comply with an enhanced surface water treatment rule.

Future regulations developed by EPA under the Safe Drinking water Act and the Clean Water Act will likely have additional impacts on the District that can not be estimated at this time. As more constituents become regulated at lower and lower levels, it is likely that additional Delta water constituents will become problematic. For example, low level regulation of arsenic may be problematic since arsenic is present in both the state and federal water systems.

As the discharges of heavy metals from wastewater treatment plants are regulated at lower and lower levels to protect the health of aquatic ecosystems, the contribution from water supply becomes more and more significant. Low level monitoring conducted by the District indicates that Delta water metal concentrations which meet drinking water standards may not be acceptable for discharge by municipal wastewater treatment plants to surface waters such as San Francisco Bay because of water quality standards included in State Water Resources Control Board's Bays and Estuaries Water Quality Control Plan.

Summary

Delta water quality has consistently posed problems for the Santa Clara Valley Water District. Historically, these problems have been addressed through operational and minor capital improvements to our treatment facilities. New, more stringent EPA Safe Drinking Water Act regulations currently under development will necessitate large capital expenditures to make major changes to our treatment processes. Future Safe Drinking Water Act and Clean Water Act regulations may make the treatment of Delta water technically infeasible and will make it more expensive. The preferred alternative to increasingly complex treatment and increasing use of chemicals in the treatment process is securing the best source water quality possible. This is the strategy that must be pursued with respect to the export of drinking water by the state and federal systems. It is this District's policy that Delta facilities operated in an environmentally sensitive manner are needed to isolate municipal water supply sources from the influence of bromide laden saltwater intrusion and Delta agricultural drainage.



RINCONADA EFFLUENT

HISTORICAL TTHM DATA

TTHM (UG/L)

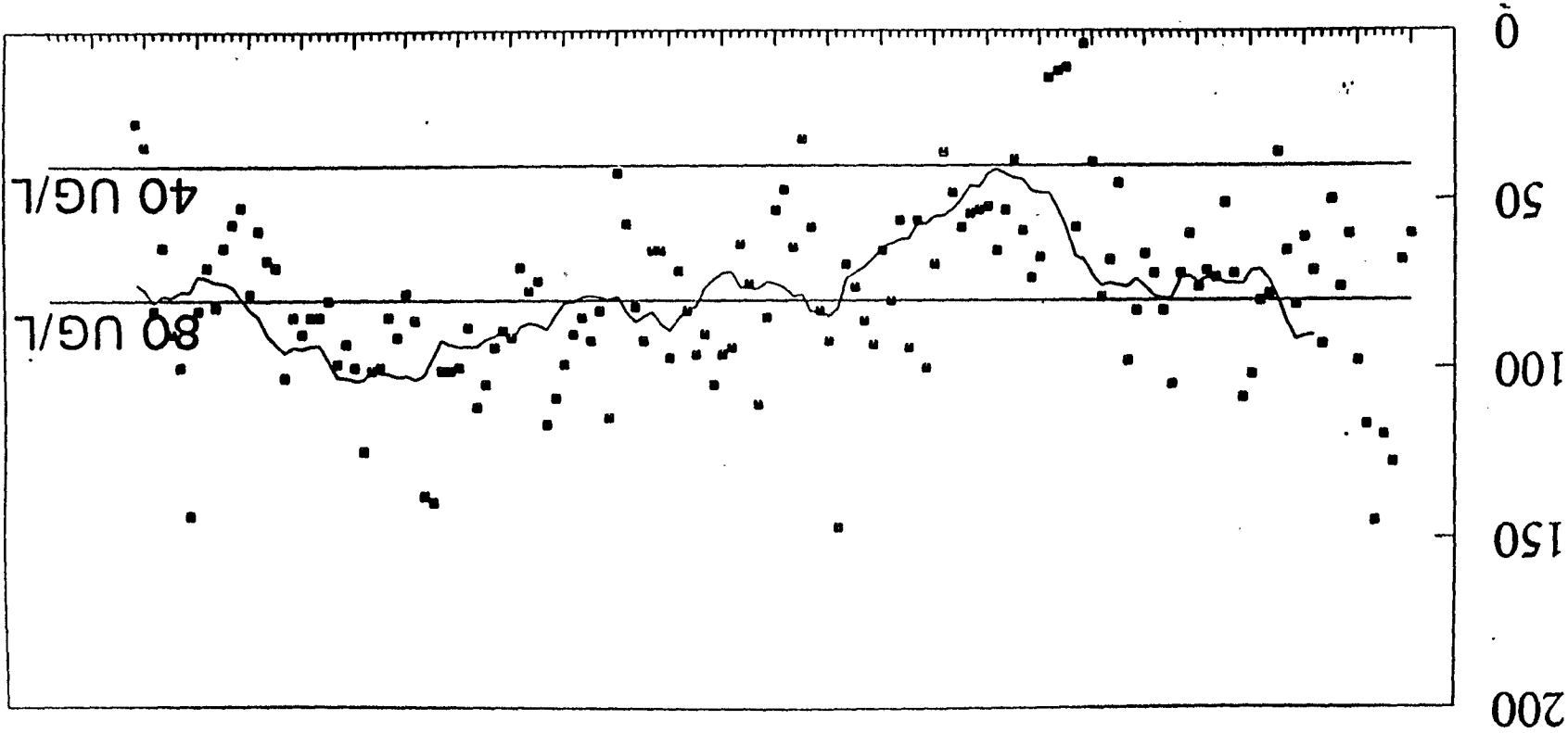


Figure 2

12-MONTH AVG CONCENTRATION
MONTHLY CONCENTRATION
YEAR
81 82 83 84 85 86 87 88 89 90 91 92 93